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SUMMARY OF RE-ANALYSIS OF THE LOCATION FOR THE SOUTH ROUTE OF INTERSTATE HIGHWAY NO. 94 BETWEEN FALLON AND GLENDIVE

December 15, 1961

On November 9, 1959, a report was released concerning the results of an economic analysis of the merits of two alternate locations for Interstate Route No. 94 from a point southwest of Fallon to a point east of Glendive. One route was located on the north side of the Yellowstone River, and it followed quite closely the location of the present highway between these two places. The other route was located on the south side of the river on a new alignment.

The results of this report showed that the North Route was the most favorable location when all construction, maintenance and vehicle operating costs were taken into consideration. The differential in favor of the North Route amounted to $161,534 per year.

Because of the unfavorable terrain and slide areas on the south side of the river, it was necessary to locate the South Route on a line which avoided the undesirable areas, with the result that the length of the route was increased over the length of a more direct line between the control points. The location for the South Route also involved the construction of four-lane sections in certain areas where the grades made such construction necessary to meet the prescribed standards for Interstate highway construction.

After the report had been reviewed by interested parties, it was suggested that consideration should be given to the possibility of selecting a different line on the south side of the river which would follow as close as possible to the railroad tracks through this area. It was the thought that such a line would be shorter and it would also eliminate the need for four-lane construction for the reason that more moderate grades could be achieved.

The purpose of this summary is to report the results of an analysis of a revised South Route which would follow the general location of the railroad through this area. The locations for the North Route, the Original South Route and the Revised South Route are shown on the enclosed map.

Certain tables, on pages 7, 9, 16 and 17 of the original report of November 9, 1959, presented comparisons of pertinent data for the North and South routes. As a part of this summary, these tables have been revised to show comparable data for the North Route, the Original South Route and the Revised South Route.

Revised tables of pages 7 and 9 present a comparison of construction and maintenance costs for the Interstate routes and their related facilities. The revised table of page 16 present a comparison of traffic and vehicle operating costs for each routing proposal. The revised table of page 17 presents a summary of the construction, maintenance, vehicle operating and total overall costs for each proposal, as consolidated from the data in the other revised tables.

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Principal features of the re-analysis of the highway location on the south side of the river are described below:

1. The location for the Original South Route involved a length of 37.459 miles. The length of the Revised South Route is 36.055 miles, a reduction of 1.404 miles.

2. The location for the Original South Route required that four-lane construction be built through sections amounting to 10.609 miles. The improved grades on the Revised South Route eliminate the need for four-lane construction, except for a 3.032 mile section in the Glendive area. Four-lane construction through this area is planned for all alternate routes.

3. The total cost for the Original South Route is $10,932,000. When the principal construction items are divided by their estimated service lives, the total cost figure is reduced to an annual cost figure of $337,150.

   As the result of shortened length and the elimination of the rural four-lane construction, the total cost figure for the Revised South Route is estimated at $9,991,000. The related annual cost figure is $309,770, or $27,380 less than the Original South Route.

4. The shortened length and the elimination of rural four-lane construction also reduces the maintenance costs for the Revised South Route as compared with the Original South Route. The annual maintenance cost for the Original South Route is $66,798. The cost for the Revised South Route is $57,115. The savings for the Revised South Route amount to $9,683 per year.

5. As shown on the enclosed map, the location for the Revised South Route is about one mile north of the Original South Route in the vicinity of the interchange with FAS Route 335 near Cedar Creek. This situation requires that an additional mile of Secondary System highway be constructed, as compared with the Original South Route, to provide the required connection with the Interstate highway. The annual amortized cost of construction and the annual cost of maintenance for this one-mile section increase the cost by $2,667 per year over the figures reported for the Original South Route.

6. Insofar as traffic service is concerned, the traffic entering and leaving the Revised South Route from FAS Route 335 will have to travel about one mile more on Secondary System highway, whereas this travel could be performed on Interstate highway under the location for the Original South Route. This differential amounts to $7,781 per year of extra travel cost for the Revised South Route.

7. The location of the Original South Route southeast of Fallon provided Interstate highway service for local residents in this area. This traffic cannot reach the location of the Revised South Route; therefore, this traffic must use county roads in place of the Interstate highway. This travel cost differential amounts to $13,370 per year more than the Original South Route.

8. The travel distance over the Revised South Route is 36.055 miles, as compared with 37.459 miles for the Original South Route. This distance savings of 1.404 miles reduces the Interstate vehicle operating costs for the Revised South Route by $53,753 per year, as compared with similar vehicle operating costs for the Original South Route.

   These travel adjustments under paragraphs 6, 7, and 8 amount to a net savings in vehicle operating costs of $32,602 per year in favor of the Revised South Route, as compared with the Original South Route.

9. These adjustments in annual construction costs, annual maintenance costs and annual vehicle operating costs are shown in the enclosed revision of the table on page 17 of the original report. From this table it may be noted that the location for the Revised South Route produces annual construction costs savings of $25,213, annual maintenance cost savings of $9,183, and annual vehicle operating cost savings of $32,602 per year. In combination, these savings for the Revised South Route amount to $66,998 per year, as compared with the Original South Route.

   This table also shows, however, that although the Revised South Route would cost $66,998 per year less than the Original South Route, the annual costs for the Revised South Route are still $94,536 more than similar costs for the North Route.

IT MUST BE CONCLUDED, THEREFORE, THAT THE NORTH ROUTE REMAINS THE PREFERRED LOCATION FOR INTERSTATE ROUTE NO. 94 ON THE BASIS OF ECONOMIC CONSIDERATIONS.

In further support of this decision, reference should be made to the comprehensive geologic report which has been prepared of this area. This report describes in considerable detail the geologic features which are encountered along the Original South Route and the Revised South Route. Particular attention is given to the active and quiescent slide areas on the south side of the river and particularly in the vicinity of the Revised South Route. Some of these slide areas have been a source of constant trouble to the railroad facilities.

The following important conclusions have been extracted from this report:

From pages 14 and 15 of the narrative. "From a foundation standpoint, then the line parallel to the Northern Pacific Railway would be very difficult and expensive to construct at or near the indicated location, but more important, maintaining an alignment up to interstate standards in this location would be impossible. The original

south line is probably the shortest routing that will avoid the unstable and potentially unstable areas. It will, however, require careful design, especially in the areas east and west of Cedar Creek. The foundation situation on the north line is considerably better than on either south line, not only because of natural conditions, but also because of the decided advantage of being able to observe conditions on the present US 10 which was constructed to primary standards less than five years ago."

From pages 1 and 2 of the summary "The location which was originally staked south of the Yellowstone River was routed to avoid three large areas of "breaks" topography. In an attempt to shorten the alignment, a line proposal was drawn within these breaks, parallel to the Northern Pacific Railway alignment, and submitted to this office for foundation analysis. The areas have been studied, information gathered, and the conclusion reached that from a foundation standpoint, so many problems exist in these areas that it is strongly suggested that no location be chosen which lies within these three "break" areas.

A great deal of evidence exists along the railroad alignment of difficulties due to unstable fills and backslopes. Two large relocations have been made on this account, at least three electric signals have been installed in active slide areas, and long speed limit zones have been established.

Areas of active and quiescent landsliding have been outlined on the areas in question. These represent areas over which no feasible construction practice short of complete removal could assure a stable roadway. This is not to say that all of the previous landslides which are evident in this area, and which have slid into a position of apparent stability, would move again during or after highway construction. However, past experience with such areas indicates that large fills or cuts which create a weight unbalance in an area which has already slid at least once, can, and often do, cause re-activity. A relatively small area of landslide is often curable within economic reason and can be utilized for highway construction, but a large area of such slides could be disastrous.

A line paralleling the railroad would have to be moved far enough into the breaks to the south to avoid these presently active and pre-existing slides. If this is done, several other problems exist. Backslope design in any of the poorly consolidated sedimentary beds in this area will be, at a minimum, 2:1. Groundwater discharge in the gulches over which fills must be placed will require special drainage considerations, since any water added to the silty or clayey formations, above natural moisture, creates instability. Roadway runoff must be controlled in such a manner as to reduce slope erosion. The need for adequate drainage in each and every one of the erosion gullies within these breaks is obvious.

In view of the obviously better foundation conditions which exist on the original south alignment, and the even better foundation conditions which exist along the P.T.W., this office strongly recommends the use of one of these alignments."

The geologic report and the excerpts quoted above strongly emphasize the inherent dangers involved in attempting to construct and maintain a highway through the large, unstable areas along the Revised South Route which result from the active and dormant slides and subsurface drainage situations encountered in that vicinity.

The figures in the enclosed cost tables for the Revised South Route are based on the cost of constructing and maintaining a highway through the area under normal conditions. It is not possible to estimate the amount of additional cost that would develop in constructing through the slide areas; however, experiences in potentially less dangerous areas throughout the state have shown that the cost can become prohibitive.

IN SUMMARY, IT CAN BE STATED THAT THE REVISED SOUTH ROUTE IS CONSIDERABLY LESS FAVORABLE THAN THE NORTH ROUTE FROM AN ECONOMIC STANDPOINT. OF MORE IMPORTANCE, HOWEVER, IS THE FACT THAT THE LOCATION FOR THE REVISED SOUTH ROUTE IS DEFINITELY UNACCEPTABLE FROM AN ENGINEERING AND CONSTRUCTION STANDPOINT BECAUSE OF THE UNSUITABLE TERRAIN INVOLVED.

IT MUST BE CONCLUDED THAT THE NORTH ROUTE REMAINS THE MOST FAVORABLE LOCATION FOR INTERSTATE ROUTE NO. 94 BETWEEN FALLON AND GLENDIVE.

REVISION OF TABLE ON PAGE 7
OF FALLON TO GLENDIVE
ECONOMIC HIGHWAY ANALYSIS

ESTIMATED INTERSTATE CONSTRUCTION COSTS

COST ITEM	YEARS LIFE	NORTH ROUTE TOTAL COST	NORTH ROUTE ANNUAL COST	ORIGINAL SOUTH ROUTE TOTAL COST	ORIGINAL SOUTH ROUTE ANNUAL COST	REVISED SOUTH ROUTE TOTAL COST	REVISED SOUTH ROUTE ANNUAL COST
Right-of-way	50	$ 588,000	$ 11,760	$ 651,000	$ 13,020	$ 659,000	$ 13,180
Structures	50	4,566,000	91,320	1,699,000	33,980	1,372,000	27,440
Base and surface	20	2,242,000	112,100	2,704,000	135,200	2,301,000	115,050
Traffic services	20	270,000	13,500	320,000	16,000	505,000	25,250
Other items	40	3,718,000	92,950	5,558,000	138,950	5,154,000	128,850
TOTAL		$11,384,000	$321,630	$10,932,000	$337,150	$ 9,991,000	$309,770
Length - miles		35.097		37.459		36.055	
Cost per mile		$324,358		$291,839		$277,104	
Average life		35.39 years		32.42 years		32.25 years	

REVISION OF TABLE ON PAGE 7
OF FALLON TO GLENDIVE
ECONOMIC HIGHWAY ANALYSIS

ESTIMATED INTERSTATE MAINTENANCE COSTS

	NORTH ROUTE	ORIGINAL SOUTH ROUTE	REVISED SOUTH ROUTE
Miles of 2-lane highway	31.213	26.850	33.023
Cost per mile	$1,500	$1,500	$1,500
Annual maintenance cost	$46,820	$40,275	$49,535
Miles of 4-lane highway	3.884	10.609	3.032
Cost per mile	$2,500	$2,500	$2,500
Annual maintenance cost	$9,710	$26,523	$7,580
TOTAL ANNUAL MAINTENANCE COST	$56,530	$66,798	$57,115

REVISION OF TABLE ON PAGE 9
OF FALLON TO GLENDIVE
ECONOMIC HIGHWAY ANALYSIS

SECONDARY SYSTEM CONSTRUCTION AND MAINTENANCE COSTS

	NORTH ROUTE	ORIGINAL SOUTH ROUTE	REVISED SOUTH ROUTE
Construction on FAS Route 335:			
Miles involved	16	4	5
Total cost	$846,000	$66,000	$131,000
Annual cost	$ 28,200	2,200	4,367
Maintenance on FAS Route 335:			
Miles involved	16	4	5
Annual cost	$8,000	$2,000	$2,500
TOTAL CONSTRUCTION AND MAINTENANCE COSTS	$36,200	$4,200	$6,867

Remarks: Under the Revised South Route, it would be necessary to construct and maintain an additional mile of FAS Route 335 in order to connect with the Interstate System highway which would be about one mile farther north than the Original South Route. The increased costs for construction and maintenance of this additional mile are included in this table.

REVISION OF TABLE ON PAGE 16
OF FALLON TO GLENDIVE
ECONOMIC HIGHWAY ANALYSIS

ESTIMATED TRAFFIC AND VEHICLE OPERATING COSTS

	ANNUAL VM OF TRAFFIC	AVERAGE UNIT COST	TOTAL ANNUAL COST
NORTH INTERSTATE ROUTE:			
Interstate highway-rural	11,759,935	$.1259	$1,480,652
Primary highway-rural	635,465	.1491	94,766
Secondary hgihway-rural	1,813,685	.1522	275,954
County roads-rural	584,365	.1758	102,707
City streets-urban	239,075	.1851	44,264
TOTAL	15,032,525	$.1329	$1,998,343
ORIGINAL SOUTH INTERSTATE ROUTE:			
Interstate highway-rural	10,295,190	$.1210	$1,245,432
Primary highway-rural	4,026,315	.1638	659,603
Secondary highway-rural	207,320	.1501	31,124
County roads-rural	862,860	.1628	140,428
City streets-urban	318,645	.1851	59,002
TOTAL	15,710,330	$.1359	$2,135,589
REVISED SOUTH INTERSTATE ROUTE:			
Interstate highway-rural	9,854,202	$.1210	$1,191,679
Primary highway-rural	4,026,315	.1638	659.603
Secondary highway-rural	259,150	.1501	38,905
County roads-rural	944,985	.1628	153,798
City streets-urban	318,645	.1851	59,002
TOTAL	15,394,297	$.1366	$2,102,987

Remarks: Adjustments to the traffic and vehicle operating cost figures for the Revised South Route have been made for the following reasons:

1. The more northerly location for the Revised South Route mades it necessary that traffic on south FAS Route 335 travel about one additional mile on Secondary System highway in place of equivalent travel on Interstate System highway for the Original South Route location.

2. Traffic southeast of Fallon, which would have been served by the Interstate highway under the Original South Route location will not be able to use the Revised South Route. This produces an increase in county road travel and a decrease in Interstate highway travel.

3. The Revised South Route is 1.404 miles shorter than the Original South Route. Traffic over the shortened sections would benefit from reduced travel distance and vehicle operating costs.

REVISION OF TABLE ON PAGE 17
OF FALLON TO GLENDIVE
ECONOMIC HIGHWAY ANALYSIS

SUMMARY OF ALL COSTS

ANNUAL COSTS INVOLVED FOR -	NORTH ROUTE COMBINATION	ORIGINAL SOUTH ROUTE COMBINATION	REVISED SOUTH ROUTE COMBINATION	DIFFERENCE IN SOUTH ROUTES
Interstate construction	321,630	$ 337,150	$ 309,770	$ -27,380
Interstate maintenance	56,530	66,798	57,115	-9,683
Subtotal	378,160	403,948	366,885	-37,063
Secondary construction	28,200	2,200	4,367	⁄2,167
Secondary maintenance	8,000	2,000	2,500	⁄500
Subtotal	36,200	4,200	6,867	⁄2,667
Primary maintenance	- - - -	30,500	30,500	- - - -
ALL CONSTRUCTION	349,830	339,350	314,137	-25,213
ALL MAINTENANCE	64,530	99,298	90,115	-9,183
SUBTOTAL	414,360	438,648	404,252	-34,396
Interstate operating costs	1,480,652	1,245,432	1,191,679	-53,753
Primary operating costs	94,766	659,603	659,603	- - - -
Secondary operating costs	275,954	31,124	38,905	⁄7,781
County road operating costs	102,707	140,428	153,798	⁄13,370
City street operating costs	44,264	59,002	59,002	- - - -
ALL OPERATING COSTS	1,998,343	2,135,589	2,102,987	-32,602
GRAND TOTAL OF ALL COSTS	$2,412,703	$2,574,237	$2,507,239	$ -66,998
ANNUAL SAVINGS IN FAVOR OF NORTH ROUTE		$161,534	$94,536	